Polymer synthesis

Controlled 2.3 l polycondensation autoclave [Juchheim] (1.33 Pa to 1.5 MPa, < 350 °C, inert gas)

Polymerisation autoclave [Büchi] for controlled metallocene catalysed synthesis of polyolefins (1 l glass to 5 l stainless steel vessels) (0.05 to 1.5 MPa, < 200 °C, argon as inert gas) monitored olefin consumption by pressflow gas controller (Büchi), special software for data logging

Reaction calorimeter [Mettler-Toledo] (1.8 l, < 5 MPa, < 220 °C)

Light microscopes with heating stage [LINKAM, Carl Zeiss Jena] (heating stage - 196 to 600 °C, 0.01 to 130 K/min, polarisation, phase contrast and interference microscopy)

Hard- and Software for molecular modelling (GROMACS - molecular dynamics simulation, GAMESS - ab initio quantum mechanics, in parallelized processor mode), for Rietveld refinement (BGMN, and selfdeveloped molecular building software) as also as for meanfield calculations (self dev. package MORPHOLOGY incl. TCL interpreter in parallelized mode) for common double processor PCs with LINUX Kernel version 2.4.

Devices for mixing, modification and processing of small amounts

Miniature mixing reactor EK-3-5C [NSC, Japan] (volume: 3 cm^3)

Microtruder RC-0250 [Randcastle, USA] (10 to 160 g/h)

Micro-compounder and Micro-injector [DACA-Instruments, USA] (volume: 4.5 cm^3)

Modification of polymer surfaces

Preparation and characterization of mono and LB multilayers

Langmuir-Blodgett troughs [KSV, Lauda, Nima]

Brewster angle microscope [Nanofilm Technologie]

Fluorescence-, UV-VIS and FTIR spectrometer [Perkin Elmer]

Surface modification by plasma treatment and plasma-based processes

Plasma processor MicroSys 400 [Roth & Rau]

- multi-chamber high-vacuum system
- microwave excitation 2.45 GHz und high-frequency excitation 13.56 MHz
- process gases: Ar, H_2, N_2, O_2, CO_2, NH_3, SO_2
- feeding systems for vaporous media
- plasma diagnostics by means of mass spectroscopy and optical spectroscopy
- chamber for FTIR-ATR spectroscopy

Plasma processor Darius 10 H/M [Buck Plasma Electronic] (process gases and excitation frequencies as above, tumbler for treatment of powders)

Sputter - Coater [Tectra GmbH]

- two magnetrons working in DC and RF regime; thickness monitor based on quartz crystal balance; rotating stage to ensure homogeneous covering

Surface modification by electron beams

Universal electron irradiation plant with electron accelerator ELV-2 [Budker Institute for Nuclear Physics Novosibirsk]

electron energy: 0.6 to 1.5 MeV, beam power: 20 kW

continuous, batch and stationary radiation procedures and experiments

Laterally controlled structure formation and polymeric micro- and nanostructures

Low-voltage scanning electron microscope LEO Gemini DSM 982 [Zeiss] (resolution at 30 kV: 1 nm; at 1 kV: 4 nm) with electron beam lithographic system ELPHY [Raith]

ELPHY Plus Lithography System [Raith GmbH] with electrostatic beam blanker

Scanning electron microscope LEO 435 VP

Reflected-light microscope with integrated AFM tracer Axiotech/Ultraobjektiv [Zeiss]

Inverse light microscope with laser-optical tweezers Axiovert 135/SL Microtest [Zeiss]

Nano-scale triaxial positioning elements [Klocke Nanotechnik]

Ultramicrotome Ultracut S including cryo device FCS [Reichert/Jung]

Sputtering device SCD 050 [Balzers]

Evaporation device UNIVAC for two-layers deposition [Leybold]

Imaging Ellipsometer I-Elli 2000 [Nanofilm Technologie]

single wavenlength (633 nm HeNe), multiple-angle nulling type in PCSA configuration

lateral resolution 2 µm

Ellipsometer Multiskop with mikroscopy module

Research ellipsometer SE 400 [Sentech GmbH]

Membrane-specific laboratory equipments for determination of permeate parameters

Laboratory pervaporation device P 28 [CM-CELFA Membrantechnik AG, Switzerland] ($p < 3.5$ MPa, $T < 90$ °C, $V < 500$ ml; membrane area = 28 cm^2)

Dead-end filtration cells for the filtration of small volumes

Different models ($p < 1$ MPa, V up to 400 ml, membran area from 15 to 45 cm^2), partially stirred

Test cells for tangential cross flow mode

Different models ($p < 0.3$ MPa, membrane area 15 to 600 cm^2)

including a Reichelt gear pump $p_{max} = 0.7$ MPa; $v_{max} = 60$ l/h

Gas permeation device GDP-C [Brugger]

Spectral photometer CADAS 100 [Dr. Lange GmbH] and density meter DMA 58 [A. Paar KG, Austria] for determination of feed and permeate composition (concentration)

Pilot plants for processing of thermoplastics

Compounding

Co-rotating twin-screw extruder MICRO 27 [Leistritz], ZSK 40 and ZSK 30 [Werner & Pfleiderer], ZE 25A UTS [Berstorff]

Counter-rotating twin-screw extruders MICRO 27 [Leistritz], ZK 35 [Collin]

KoKneader [Buss] with discharge screw or cooling conveyor/chill roll combination

Gravimetric feeding units (also for badly-flowing materials)

Various feeders for liquids (from free-flowing to paste-like)

Side feeders for solid substances

Lab-mixer and Lab-twin-screw-extruder [Haake] (16 mm, < 300 ^{o}C, 50 ccm, 250 - 1000 g/h)

Extrusion

Single-screw and twin-screw extruders

Extruder downstream equipment

sheet discharge unit (b < 250 mm, 1 mm < d < 4 mm [Collin])

flat film extrusion line Chill-Roll 136/350 (flat film die b = 250 adapter for ABA-coextrusion [Collin])

blown-film discharge unit 180/400 with blowing die d = 60 [Collin])

pipe discharge units [DAVO]

profile bar discharge units [DAVO]

water-cooled and air-cooled die-face pelletizers [Leistritz, Collin]

strand dies/pelletizers following cooling in water bath [e.g. Scheer, Rieter, Collin]

Process analysis/Extrusion monitoring

Test stand adaptable to ZSK 40 [Werner & Pfleiderer]

specific measuring and sampling plates for positioning of analytical sensors (IR spectroscopy in transmission and ATR modes) and for simultaneous determination of states and morphologies of the melt for example by labelling with radioactive nuclides

Process microphotometer [TOPAS] for in-line and real-time particle extrusion monitoring in flowing plastics melts

adaptable to several extruders

NIR-Diode array process spectrometer [SENTRONIC], (900-1700 nm, InGaAs detector array) with transmission and diffuse reflectance process probes

Raman process spectrometer HoloProbe 785 [Kaiser Optical Systems] (excitation at 785 nm, holographic imaging, spectrometer with CCD detector, two fibre-coupled Raman probes for laboratory experiments and process control)

Ultrasonic process system, pulse-transmission method, with ultrasonic probes for 2 an 5 MHz

Fibre formation by melt spinning processes

Universal laboratory high-speed spinning plant for mono- and multi-filament and hollow and profiled fibres

extrusion: single screw and twin-screw extruder, max 3 kg/h, 450 and 350°C [Leistritz]

online drawing: 3 heatable godet pairs, [Dienes], max. 7200 m/min

winding: high-speed winder [Barmag], max. 6000 m/min

Plunger spinning equipment [institute-made] (T_{max} = 420 °C, $_{min}$ 10 g, v_{max} = 1200 m/min)

Multi-stage laboratory drawing equipment [Dienes]

Various on-line measuring systems for running fibres

fibre tensile forces [Honigmann]
fibre temperatures: IR-Thermography VarioTHERM® [Jenoptic/Infratec]
fibre speeds [TSI Inc. and Enka tecnica]
fibre diameter control [Zimmer]

Fibres testing (tensile test, sonic modulus, birefringence, conductivity)

Melt spinning equipment for medical applications (GMP-conditions)

single and twin-screw extruder [Collin] (winder with vmax = 4000 m/min [Barmag], online-drawing
extrusion: single screw and twin-screw extruder, max 3 kg/h, 300°C, [Collin]
online drawing: 3 heatable godet pairs, [Retech]
winding: max 4000 m/min [Barmag]

Injection moulding

Injection-moulding machines of up to 1000 kN clamping force [Battenfeld, Demag]

Two-components injection-moulding machine [Engel]

Injection units also for thermosets and PVC-H

Injection-moulding tools for

specimens according to CAMPUS
test sheets (variable thickness)
two-components tensile and peel specimens
single-cavity mouldings for low amounts of material
spiral test
special specimens (DMA, etc.)

Compression moulding

Laboratory press [Weber] (160 mm x 160 mm, force up to 450 kN, < 500 °C)

Presses [Fontijne, Schwabenthan] (force up to 1000 kN, < 400 °C and working width up to < 450 mm x 450 mm, programmable)

Laboratory press for sample preparation [PW 20, P/O/Weber] (clamping force up to 200 kN, < 300 °C or 180 °C under vacuum, 8, 13 and 25 mm Ø)

Calendering

Laboratory Roll Mill type 110 P [Collin]

Pelletizing, milling and mixing equipment

Fluid and powder mixers for 4 to 150 l

Pelletizers

Fluid and powder mixers 0,5-3,5 l [MTI]

Milling and classifying Multiprocess-Equipment [Hosokawa-Alpine] (impact mill for Mohs-hardness: 1 - 3,5; jet mill for Mohs-hardness: 1 - 10; classifier mill 1 - 100 kg)

Fibre-reinforced composites

Manufacture of composites

Glass-fibre spinning equipment with multi-stage size application [institute-made] (204 nozzles)

Roving winding and air-texturing devices DS 90 for production of hybrid filament yarns [Dietze & Schell]

Plants for manufacture of prepregs [institute-made] (vertical plants for flat prepregs, b = 300 mm or 600 mm, < 1 kg resin; discontinuous equipment for unidirectional prepregs)

Laminate presses (clamping force up to 1000 kN, < 400 °C and working width < 450 mm x 450 mm, programmable)

Laboratory equipments for resin injection according to the RTM procedure [institute-made and PLASTECH Co.]

Characterization of interface properties

Single-fibre pull-out [institute-made] (temperature range < 300 °C and force range < 1.5 N)

Single fibre cyclic loading [institute-made] (investigation of interphases, microfatigue, frequency range 10 to 100 Hz, strain amplitude 0.3 to 2.5 µm, force amplitude 1mN to 50 N

Hysteresis test [institute-made] (investigation of interphases, frequency range 1 to 10 Hz, force amplitude 1mN to 2.5 N)

Manufacture of single fibre model composites (PC controlled temperature-time cycles, equipment with 3 modules) [institute-made]

Manufacture of preforms by means of the Tailored Fibre Placement technology

Electronically controlled embroidery machines with laser beam cutting unit TMLG-608 U and to 108 [Tajima] (608: 4 heads with a working area of 710 mm x 750 mm each ; 108: 8 heads with a working area of 645 mm x 785 mm each)

Robot with sewing head [Altin] (3D ready making, working area semi-circle 1.3 m)

Fully-fashioned gantry robot [Altin] (Ready-making of 2D-preforms)

2D-TV-holographic systems [Ettemeyer] (Speckle interferrometry for 3D-measurements)

Sewing robot Motoman SK 45

ZSK-Stitch robot JC 0209/01-275T [Heinz Walz GmbH]

Surface characterization

Surface spectroscopy

X-ray photoelectron spectrometer AXIS ULTRA [KRATOS ANALYTICAL] either with non-chromatic Mg or Al X-ray source or with monochromatic Al or Ag X-rays, element specific imaging with lateral resolution of > 10 µm. Sample transfer system

for sample heating (max. 600 °C) or cooling (-190 °C)

time-of-flight secondary-ion mass spectrometer

TOF-SIMS III [ION TOF] with a Ar+ ion source, element or molecule specific

imaging with lateral resolutions of 10 µm.

High-speed In-situ-44-wave lengths ellipsometer [Woollam Co.] (spectroscopic ellipsometry 415...750 nm, computer-aided goniometer

(20 to 90 degrees, x-y-sample positioning stage)

Surface roughness measurements

MicroGlider® (FRT) for optical measurements of topography combined with SFM

Scanning force microscopy/direct force measurements

Scanning force microscopes Nanoscope IIIa-Multimode, -Bioscope, -D3100, NanoScope IV-D3100 [Digital Instruments]

nanoindentation and heating stage

Surface force apparatus MASIF [ANUTEC]

Electrokinetic methods

Electrokinetic analyzer EKA [A. Paar] (specific measuring cells for streaming potential measurements of powders, fibres and solids sheets in aqueous systems [institute-made])

Micro-slit electrokinetic setup [institute-made] (combined determination of zeta potential, surface conductivity and hydrodynamic layer thickness of adsorption layers at planar solid interfaces)

Device for electroosmosis measurements in aqueous and organic systems [institute-made] (measuring cells for porous materials)

ZetaSizer 3 and ZetaSizer 3000 [Malvern Instruments] (electrophoresis measurements in dilute aqueous or organic dispersions of less than 1 vol-% with simultaneous particle size determination 10 to 3000 nm)

Acoustic and electroacoustic spectrometer DT-1200 [Dispersion Technology, Inc.] (determination of zeta potential and particle size in dispersions of 0.1-50 vol-%)

Wetting and surface (interface) tension

Contact angle measuring systems ADSA-P (Axisymmetric Drop Shape Analysis Profile) and ADSA-CD (Contact Diameter) [institute-made]

simultaneous determination of contact angles, surface tension, contact radius and volume of sessile liquid drops

measuring cell for inverse contact angle measurements with air bubbles at room and elevated temperatures

determination of very small contact angles (< 20°) at heterogeneous and rough surfaces ADSA-CD

Determination of the surface free energy of porous solid systems (powders, fibre bundles, flat membranes and capillary membranes) by time-dependent measurement of the capillary penetration of liquids of different surface tensions (Tensiometers K12 and K14, KRÜSS)

Devices for simultaneous determination of density and surface (interface) tension of polymer melts at temperatures of up to 400 °C, ORS2, ORS3 and ORS4

of polymer melts at temperatures of up to 400 °C OBS2, OBS3 and OBS4 [institute-made] (modified ADSA and Wilhelmy technique)

Contact angle measuring devices G 40 and DSA 10, tensiometer K12 and K14 [Krüss]

Adsorption of substances from gaseous and liquid phases

Microcalorimeter system TAM 2277 [ThermoMetric] (titration calorimetry 5 to 85 °C), Flow sorption calorimetry [institute-made cells] (solid-vaporous phase interaction by means of perfusion cell)

Inverse gas chromatography by means of HP 6890 [Hewlett Packard]

Potentiometric titration at dispersed solids of different sizes [institute-made]

Automatic sorptometer Autosorb-1 [Quantachrome] (low-temperature gas adsorption for determination of the BET surface area (> 0.01 m^2/g) and porosity (Ø 1 to 50 nm)

IGA 2000 [HIDEN] (adsorption of water vapour and organic solvents)

Biosurface Engineering and Characterization of Bio-Interfacial Phenomena

Surface modification of biomedical polymers

Plasma processor MicroSys 400 comprising a primary chamber (MW-ECR excitation), a secondary chamber for pre- and post treatments, and a chamber for FTIR-ATR spectroscopy [Roth & Rau]

Spin-coater RC 5 [Karl Suss]

Dipping set-up (preparation of gradient surfaces) [institute-made]

Basic techniques for preparation of polymer films (plasma cleaner, snow jet)

Surface characterization and protein analytics

Electrokinetic Analyzer EKA [Anton Paar]

Microslit electrokinetic set-up [institute-made], optional with simultaneous ATR-IR spectroscopy or RIFS

Set-up for potentiometric titration [institute-made]

Enhanced EL X-02C Ellipsometer [Dr. Riss]

Sub-monolayer ellipsometer [Dr. Riss Ellipsometerbau] with flow set-up [institute-made]

Videoassisted optical contact angle measuring system OCA30 [DataPhysics Instruments]

Micro-DSC [Setaram]

Microcalorimeter system [ThermoMetric] (titration cells, flow sorption cells, perfusion cell)

2-D-Gel electrophoresis [Pharmacia]

Lumi-Imager [Roche]

Free-flow electrophoresis [Tecan]

Capillary electrophoresis [Beckman Coulter]

HPLC with fluorescence detector [Agilent Technologies]

LC-system HP 1100

ESI-TOF mass spectrometer [Applied Biosystems]

Fluorescence spectrometer [Jobin Yvon]

Basic techniques for cleaning and characterization of proteins (freeze drying device, hydrolysis system, refrigerated centrifuges, microdialysis, UV-VIS spectrometer, FPLC)

Spectralpolarimeter for the measurement of circulardichroism 165-900 mm

Surface plasmon resonance spectrometer [institute-made] (SPR)

Molecular modelling

Software Cerius2 [Accelrys Inc.], Workstation SGI/OCTANE/SE R12000, 300MHz

Cell culture, cytometry and biophysics

Membrane force transducer apparatus MFTA (cell adhesion measurements by micro-mechanic pipet aspiration experiments) [institute-made]

Laser scanning cytometer LSC 2 [CompuCyte]

Confocal laser scanning microscope LSM 20/50 [Leica] combined with AFM [Digital Instruments]

Environmental scanning electron microscope (ESEM) [Philips]

Critical point dryer CPD 030 [Bal-Tec]

Stereo microscope with digital camera [Zeiss]

CASY 1 cell counter and analyzer [Schärfe Systems]

Inverse microscope Axiovert 200 [Zeiss] with temperature and CO_2 regulated cell incubator, scanning table [Märzhäuser] and digital camera Axiocam [Zeiss]

Flow cytometer FACS [Becton Dickinson]

PCR with fluorometer Light Cycler [Roche]

Scanning Probe Microscope [Pico-SPM]

Cell Sorter Cytoman [Evotec]

Basic techniques for cell culture, cell separation, and PCR

Hemocompatibility tests

Screening and perfusion incubation chambers and systems [institute-made]

Micro-titer plate photometer Anthos 2010 [Anthos-Mikrosysteme]

Blood cell counter, Coulter AcT diff [Coulter]

Blood analyzer i-stat [Hewlett-Packard]

Automatic micro-titer plate processor for ELISA [Qiagen]

Polymer analysis

IR und Raman spectroscopy

Infrarot Fourier spectrometer EQUINOX 55 [Bruker Optik GmbH] with IR microscope [Bruker] (DTGS and MCT detector, different reflection methods (ATR, DRIFT, IRRAS), photoacoustic measuring cell PAS, programmable heating chamber and microscope heating stage, automatic spectra search by means of Hummel polymer spectra library and Bruker-Merck spectra library)

NIR-FT-Raman module FRA 106 and Raman microscope [Bruker] (excitation at 1064 nm, high-sensitivity Ge detector, polarizer, low-temperature detector)

Spectrometer EQUINOX 55

FTIR spectrometers IFS 55 and 28

FTIR spectrometer IFS 66v/s [Bruker] (Ulbricht sphere for NIR with sample rotor for inhomogeneous samples)

FT-IR + FT-NIR spectrometer FTS 175 (Digilab), PbS, InSb and MCT detectors, several transmission and diffuse reflection NIR-probes, flow-through cell for GPC-FTIR coupling

FT-NIR process spectrometer NIRVIS [BÜCHI], (1000-2500 nm) with transmission and diffuse reflectance process probes

ATR-IR reaction analysis system REACT-IR4000 (Mettler-Toledo), MCT detector, Si- and Diamond probes for in-situ measurements

Raman process spectrometer HoloProbe 785 [Kaiser Optical Systems] (excitation at 785 nm, holographic imaging, spectrometer with CCD detector, two fibre-coupled Raman probes for laboratory experiments and process control)

Chromatography /MALDI-TOF-MS /Elemental analysis

High-temperature size exclusion chromatograph PL-GPC 210 [Polymer Laboratories] (30 to 190 °C)

High-temperature SEC PL-GPC 220 [Polymer Laboratories] with MALLS [DAWNEOS] (40 - 220 ^{o}C)

Ambiente temperature GPC [Knauer, Hewlett-Packard] (RI, UV or viscosity detector, interface for FTIR or NMR coupling)

Gradient HPLC HP Series 1100 [Hewlett-Packard] (RI, UV DAD)

GC systems 6890 [Hewlett-Packard] (head space, pyroprobe, MS, FID and WLD)

Supercritical fluid chromatograph, [Hewlett-Packard] (flame ionisation detector, diode array detector, nitrogen-phosphor selective detector)

MALDI-TOF MS HP G2025A [Hewlett-Packard] (time lag focussing)

Elementar vario EL [Elementar] (detection of C, H, N, S)

GC - MS -system [Agilent Technologies], Pyrolysator Pyroprobe 2000 [CDS Instruments]

Characterization of dispersions and macromolecules in solution/light scattering

Particle size analyser Helos [Sympatec] (0.5 to 875 µm, wet or dry dispersion)

Mastersizer Micro Plus [Malvern Instruments]

Laser scattering photometer 4700 PS/MW [Malvern Instruments]

Lumifuge [L.U.M.] (characterisation of flocculation under the influence of gravitational forces)

Particle charge detector PCD03 [Mütek]

Potentiometric titrator Orion 960 Autochemistry System with surfactant-specific electrode [ORION], TOC 5000 [Shimadzu] (determination of the carbon content)

Particle size analyser UPA 150 [Grimm Aerosol Technik GmbH]

NMR spectroscopy

NMR spectrometer BRUKER Advance 300

widebore magnet, solid state NMR, microimaging accessory, three rf channels (X; $^{1}H/^{19}F$; $^{1}H/^{19}F/Y$)

Solids probes: MAS probe (2.5 mm) ^{19}F; ^{1}H; MAS probe (4 mm) $^{1}H/^{19}F$; ^{15}N - ^{31}P; MAS probe (2.5 mm) H - F, temperature range -150 ^{o}C to 300 ^{o}C; MAS probe (7 mm) ^{1}H; ^{15}N - ^{31}P, static wideline probe ^{109}Ag - ^{31}P

Imaging probes: micro 2.5, three orthogonal gradients, maximum gradient strength 1 T/m; diffusion probe with quadrupole gradient coil [in-house built], electrophoresis NMR system [in-house built]; rheo NMR kit

High-resolution probes: ^{1}H probe (5 mm); ^{109}Ag-^{31}P broadband probe (10 mm); inverse probe (5 mm), ^{1}H observe, ^{109}Ag-^{31}P decoupling; inverse probe for LC-NMR (4 mm i.d.), ^{1}H observe, ^{13}C decoupling

NMR spectrometer BRUKER Avance 500

widebore ultrashield magnet, solid-sate NMR, three rf channels, microimaging accessory

Solid probes: MAS probe 2.5 mm H - F – X, MAS probe 4 mm H - X - Y

Imaging probes: diffusions probe, Diff 25, uniaxial gradient 10 T/m maximum

NMR spectrometer DRX 500 [Bruker]

three HF channels (X; $^{1}H/^{19}F$; Y), z-gradient accessories and automatic sample changer

probeheads:

inverse QNP 5 mm probehead (^{1}H; ^{19}F; ^{31}P; ^{13}C) with z-gradient,

triple resonance 10 mm probehead (^{1}H; X; ^{31}P)

HR-MAS probehead for 4 mm rotors (^{1}H; ^{13}C; ^{2}H lock channel) with z-gradient

X-ray structure analysis

WAXS: 4-circle wide-angle diffractometer P4 with an area detection system HiStar / GADDS [SIEMENS, now BRUKER-AXS]; X-ray diffractometer HZG 4/A-2 [Seifert FPM] (with energy-dispersive X-ray spectrometer EDR 288 [RönTec]); molecular modelling for crystal structure analysis (RIETVELD refinement with force field constraints)

SAXS: KRATKY compact small-angle system with temperature control [A. Paar, Graz]; **RheoSAXS**: Pinhole system mounted on a rotating anode generator ultraX-18 [RIGAKU-efg, Berlin] with confocal Max-Flux-Optics [Osmic, Troy / MI] equiped with an area detection system HiStar / GADDS [BRUKER-axs, Karlsruhe] and special sample chambers: vacuum oven, adapted rheometer ARES [Rheometric

Scientific Instruments, München]

XR / GID: X-ray diffractometer XRD 3003 T/T [Seifert FPM] (with reflectometry unit and heating chamber)

Thermo-analytical characterization of polymers

Thermo-gravimetric analysis: Q500 with autosampler [TA Instruments], TGA 951 [TA Instruments] (< 1200 °C), TGA 6 with autosampler, TGA 7 [Perkin-Elmer] (40 to 725 °C)

DSC 821 with autosampler

Differential scanning calorimetry: DSC 7 [Perkin-Elmer] (-60 to 600 °C, optional modulation modulus); MDSC^{TM} 2920 and Q1000 [TA-Instruments] (-150 to 750 °C, optional modulation modulus, autosampler)

Differential Photocalorimetry: DPC 930 [TA-Instruments] (ambient to 600 °C, range of wave lenghts 285 to 440 nm)

Thermo-mechanical Analysis: TMA 40 [Mettler] (-100 to 1000 °C, 0 to 100 K/min, resolution 4.5 nm, load (also dynamic measurements at 1/12 Hz) 0 to 0.5 N, different sample geometry); TMA 943 [DuPont] (also for testing of solids in a fluid)

PVT apparatus [GNOMIX Inc., USA] (ambient to 400 °C, 10 to 200 MPa)

Dynamic-mechanical analysis with different kinds of load (tension/pressure, bending, shearing) DMA 983 [DuPont], DMA 2980 [TA Instruments] (accessible range of parameters: -150 to 500 °C, 0.01 to 200 Hz, modulus range 10^3 to 10^{11} Pa, resonance and constant frequency mode)

Dielectric spectroscopy Solartron Schlumberger 1260 (10^{-4} to 10^7 Hz, -150 to 325 °C, different arrangements of plates [novocontrol]), DEA 2970 [TA Instruments] (-150 to 500 °C, 0.003 Hz to 100 kHz, 0.01 to 50 K/min, single-surface- and remote-single sensors); resistance measurements [Statron] (10^6 to 10^{14} Ohm)

Micro-thermal analysis µTA^{TM} 2990 [TA Instruments] (ambient to 450 °C scanning range 100 µm x 100 µm, resolution < 1 µm; imaging modes topography, thermal conductivity, characterisation modes µMDTA and µTMA)

Real-time IR-Thermography VarioTHERM® [Jenoptic] (-25 – 1200 °C, 256 * 256 Pixel, resolution 0.1 K and 25 µm]

Mechanic materials testing/materials modelling/material testing

Universal testing machines 1456, Z010 [Zwick], (tension/pressure/bending, load range 10 N to 20 kN, -50 to 250 °C, several long-distance strain gauge extensometer, integration of external sensors and on-line video recording of damage), tiratest (100 kN)

Servohydraulic testing machine 810 [MTS] (up to 50 kN, -130 to 315 °C, several strain gauge extensometers)

Tensile and bending modulus for application in REM and AFM [Kammrath & Weiss] (1000 or 1.5; 200 N measuring range)

Video-measuring system for 2-and 3-dimensional strain analysis ARAMIS [GOM mbH], VEDDAC [Chemnitzer Werkstoffmechanik]

Acoustic emission analyser AMSY 4 [Vallen] (6 channels)

Impact bending (Charpy, Izod; also at low temperatures) and impact tensile test 1 to 15 J, HDT/Vicat [CEAST], density (helium-micro-pyknometer [Quantachrome] or buoyancy), ball indentation and shore-A hardness

Software system ANSYS for FEM analysis (two or three-dimensional modelling of mechanical problems in linear and non-linear dependences of material properties)

Ultra sonic measuring station IMT 8012

Cambridge Optical Shearing System for Optical Rheology CSS 450 [Raczek Analysentechnik] (up to 450 °C)

Flammability tests UL 94 [Atlas], Glowing wire test [Lindenblatt] and LOI [Stanton Redcroft]

Simulation of Ageing by Xenotest 1200 [Heraeus], oven ageing [Vötsch] and conditioning cabinet [Weiss]

Rheology

Rotation rheometers ARES and RMS-800 [Rheometric Scientific] (for polymer melts, solids (fibres, sheets, bars) and liquids, -150 to 600 °C, largely automated measurement and evaluation), OAM II (optical analysis module, simultaneous measurement of birefringence and dichroism during the mechanical measurement)

Rotation rheometers PHYSICA Rheolab MC 100 and MC 20 [PHYSICA Meßtechnik] (high-concentration solutions and melts, controlled by shear stress, oscillation and shearing, measuring systems cone/plate and plate/plate, temperature control by liquid thermostat up to 200°C, (MC 20 or gas flow up to 500 °C (MC 100))

Measuring Extruder E 1/19/25 D [Brabender OHG]

High-pressure capillary rheometer Rheograph 2002 [Göttfert] (different measuring dies, < 500 °C, pVT measurements possible, calculation of the first normal stress function according to Gleißle)

MVR/MFR-devices (SWO, Kayeness)